CLAIMS TO INVENTION

1. A broad-band polarizer comprising:

a film of at least one material having a cholesteric order and sites of non-linearly varying pitch across the thickness of said film and

at least one liquid crystal material similarly non-linearly distributed across the thickness of said film and disposed at said sites.

2. A broad band polarizer according to claim 1 wherein said non-linearly varying pitch is an exponentially varying pitch.

3. A broad-band polarizer according to claim 1 wherein said material having a cholesteric order is a polymer.

4 A broad-band polarizer according to claim 1 wherein said material having a cholesteric order is a monomer.

5. A broad-band polarizer according to claim 1 wherein said material having a cholesteric order is an oligomer.

6. A broad-band polarizer according to claim 1 wherein said at least one said liquid crystal material is a nematic liquid crystal.

7. A broad-band polarizer according to claim 1 wherein said at least one liquid crystal material is a smectic liquid crystal.

8. A broad-band polarizer according to claim 1 wherein said at least one material having a cholesteric order is photopolymerizable.

9. A broad-band polarizer according to claim 1 wherein said

at least one liquid crystal material is photopolymerizable.

10. A broad-band polarizer according to claim 1 wherein at least one of said at least one material having a cholesteric order and said at least one liquid crystal material which is polymerizable.

11. A broad-band polarizer according to claim 1 wherein the segregation rate of said at least one liquid crystal material is greater than the polymerization rate of whichever of said materials is polymerized.

12. A broad-band polarizer according to claim 1 wherein the segregation rate of said at least one liquid crystal material, is greater than the polymerization rate of said at least one material having a cholesteric order.

13. A broad-band polarizer according to claim 1 wherein the segregation rate of said at least one liquid crystal material is greater than the polymerization rate of said material having a cholesteric order.

14. A broad-band polarizer according to claim 1 wherein said at least one material having a cholesteric order is a cholesteric liquid crystal.

15. A broad-band polarizer according to claim 1 wherein said at least one material having a cholesteric order is a cyclic liquid crystal siloxane.

16. A broad-band polarizer according to claim 1 wherein said at least one material having a cholesteric order is a material

which is polymerized by cationic polymerization.

17. A broad-band polarizer according to claim 1 wherein said at least one liquid crystal material is a material which is polymerized by cationic polymerization.

18. A broad-band polarizer according to claim 1 wherein said at least one liquid crystal material is a low molecular weight material.

19. A broad-band polarizer according to claim 1 wherein said film has a thickness sufficient to totally reflect incident circularly polarized electromagnetic radiation.

20. A broad-band polarizer according to claim 1 wherein said film reflects incident circularly polarized electromagnetic radiation in the visible spectrum.

21. A broad-band polarizer according to claim 1 wherein said film reflects incident circularly polarized electromagnetic radiation in the infrared portion of the electromagnetic spectrum.

22. A broad-band polarizer according to claim 1 wherein said film reflects incident circularly polarized electromagnetic radiation in the ultraviolet portion of the electromagnetic spectrum.

23. A broad-band polarizer according to claim 1 wherein at least one of said at least one material having a cholesteric order and said at least one liquid crystal material is in the liquid state.

24. A broad-band polarizer according to claim 1 wherein at least one of said at least one material having a cholesteric order and said at least one liquid crystal material is in the solid state.

25. A method of fabricating abroad-band polarizer comprising the step of:

forming a film from at least one material having a cholesteric order and at least a given pitch and at least one liquid crystal material such that said at least one liquid crystal material is distributed non-linearly across the thickness of said film in a plurality of similarly non-linearly distributed sites having pitches greater than said at least given pitch in said at least one material having a cholesteric order.

26. A method according to claim 25 wherein said at least one material having a cholesteric order is a polymer.

27. A method according to claim 25 wherein said at least one material having a cholesteric order is a monomer.

28. A method according to claim 25 wherein said at least one material having a cholesteric order is an oligomer.

29. A method according to claim 25 wherein said at least one material having a cholesteric order is a low molecular weight material.

30. A method according to claim 25 wherein said at least one liquid crystal material is a nematic liquid crystal.

31. A method according to claim 25 wherein said at least one

liquid crystal material is a smectic liquid crystal.

32. A method according to claim 25 wherein said at least one material having a cholesteric order is photopolymerizable.

33. A method according to claim 25 wherein said at least one liquid crystal material is photopolymerizable.

34. A method according to claim 25 wherein at least one of said at least one material having a cholesteric order and said at least one liquid crystal material is polymerizable.

35. A method according to claim 25 wherein the segregation rate of said at least one liquid crystal material is greater than the polymerization rate of whichever of said materials is polymerized.

36. A method according to claim 25 wherein the segregation rate of said at least one liquid crystal material is greater than the polymerization rate of said at least one material having a cholesteric order.

37. A method according to claim 25 wherein the segregation rate of said at least one liquid crystal material is greater than its polymerization rate.

38. A method according to claim 25 wherein said at least one material having a cholesteric order is a cholesteric liquid crystal.

39. A method according to claim 25 wherein said at least one material having a cholesteric order is a cyclic liquid crystal.

40. A method according to claim 25 wherein said at least one material having a cholesteric order is a material which is polymerized by cationic polymerization.

41. A method according to claim 25 wherein said at least one liquid crystal material is a material which is polymerized by cationic polymerization.

42. A method according to claim 25 wherein said at least one liquid crystal material is a low molecular weight material.

43. A method according to claim 25 wherein said film has a thickness sufficient to totally reflect incident circularly polarized electromagnetic radiation.

44. A method according to claim 25 wherein said film reflects incident circularly polarized electromagnetic radiation in the visible spectrum.

45. A method according to claim 25 wherein said film reflects incident circularly polarized electromagnetic radiation in the infrared portion of the electromagnetic spectrum.

46. A method according to claim 25 wherein said film reflects incident circularly polarized electromagnetic radiation in the ultraviolet portion of the electromagnetic spectrum.

47. A method according to claim 25 wherein at least one of

said at least one material having a cholesteric order and said at least one liquid crystal material is in the liquid state.

48. A method according to claim 25 wherein at least one of said at least one material having a cholesteric order and said at least one liquid crystal material is in the solid state.

49. A method according to claim 25 wherein the step of forming includes the step of:

mixing said at least one material having a cholesteric order and said at least one liquid crystal material in a given ratio by weight to form a mixture.

50. A method according to claim 44 wherein said given ratio by weight is 2:1.

51. A method according to claim 48 wherein said given ratio by weight of said at least one material having a cholesteric order and said at least one liquid crystal material is in a range of 1:3 to 6:1.

52. A method according to claim 48 further including the step of adding a photoinitiator into said mixture.

53. A method according to claim 48 further including the step of adding a chiral additive to said mixture.

54. A method according to claim 51 further including the step of heating said mixture at a temperature sufficient to maintain said mixture in a liquid state.

55. A method according to claim 53 further including the step

of irradiating said mixture with electromagnetic radiation to polymerize at least one of said at least one material having a cholesteric order and said at least one liquid crystal material.

56. A method according to claim 54 wherein the step of irradiating said mixture includes the step of applying actinic radiation to said mixture.

57. A method of forming a single layer polarizer comprising the steps of:

forming a film from a first liquid crystal material and a second liquid crystal material, one of said materials having a non-linear distribution in said film across the thickness of said film at similarly non-linearly distributed sites disposed in the other of said materials.

58. A method of forming a single layer polarizer comprising the steps of:

forming a film from a first liquid crystal material and a second liquid crystal material, one of said materials having a non-linear distribution in said film across the thickness of said film at similarly non-linearly distributed sites disposed in the other of said materials.

59. The broad-band polarizer according to claim 1 wherein said material having a cholesteric order is a non-cross-linkable low molecular weight liquid crystal compound.

60. The broad-band polarizer according to claim 1 wherein said material having a cholesteric order is

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